

## COMMENTARY

# Why (Urban) Mathematics Teachers Need Political Knowledge

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Public school teachers everywhere are under attack. But “urban” mathematics teachers in public schools are in a particularly tough position of having to advocate for their students and themselves at a time when school reforms (e.g., Common Core State Standards, high-stakes tests, new teacher evaluations systems, and changes in collective bargaining agreements) are stripping them of their ability to exercise professional judgment. The low status that urban teachers experience is inextricably linked to the low status of the historically underserved and/or marginalized youth (defined here as students who are Black,<sup>1</sup> Latin@,<sup>2</sup> American Indian, and low income) that they serve. Among other things, urban mathematics teachers must: (a) negotiate their practice with colleagues, students, parents, administrators, colleges, and members of for-profit organizations who may not agree with their definitions of “mathematics,” “education,” or “learning”; (b) work with fewer material and human resources than teachers in more wealthy school districts; (c) support their students to compete on an unfair playing field that constantly changes; and (d) buffer themselves from images of students as unmotivated, not having the proper amount of “grit,” lacking role models in their community, and having cultural and linguistic obstacles to overcome, as well as

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<sup>1</sup> I use the term Black, as opposed to African American, to highlight the fact that many Black students living in the United States have ancestry in the Caribbean, South America, and Asia, among other places. Nonetheless, Black students who attend schools and live in the United States are racialized in similar ways, regardless of country of origin.

<sup>2</sup> I use the @ sign to indicate both an “a” and “o” ending (Latina and Latino). The presence of both an “a” and “o” ending decenters the patriarchal nature of the Spanish language where it is customary for groups of males (Latinos) and females (Latinas) to be written in the form that denotes only males (Latinos). The term is written Latin@ with the “a” and “o” intertwined, as opposed to Latina/Latino, to show a sign of solidarity with individuals who identify as lesbian, gay, bisexual, transgender, questioning, and queer (LGBTQ).

images of urban teachers as slackers, saviors, or people who simply could not obtain work elsewhere.

I have spent 15 years researching effective, urban high school mathematics departments that served Black, Latin@ and low-income adolescents (see, e.g., Gutiérrez, 1996, 1999a, 1999b, 2000, 2002). These were schools where students took more mathematics than was required by their district; where English learners, recent immigrants, and students who juggled childcare took college preparatory mathematics courses; where historically underserved and/or marginalized students scored better than their peers on standardized tests of mathematical achievement; where a large percentage of seniors took calculus; and where high achieving students reflected the demographics of those who attended the school. As might be expected, their teachers presented engaging lessons where students: worked in groups, used rigorous texts and appropriate technology, worked in Spanish and English, and had opportunities to do projects or problems that reflected their lives. But perhaps more important, their teachers also: met regularly (inside and outside of school) to discuss students, teaching, and mathematics; worked hard to recruit like-minded staff and to socialize new members into a strength-based perspective on students; strategized collectively to eliminate low-level courses; interpreted creatively (or simply bent) the rules to fit the long-term needs of their students; convinced colleagues of students' capabilities; refused to enact discipline policies that kept students out of the classroom; and twisted students' arms to take advanced mathematics courses. In essence, these teachers negotiated the politics of school reform, language, racism, and testing (Gutiérrez, 1999a; Gutiérrez, in preparation a; Gutiérrez & Morales, 2002).

But more than just documenting these successful mathematics departments, I was eager to help build more places like the ones I had found. I was particularly interested in the kinds of experiences and knowledge bases teachers need in order to become advocates for all students to have a deep understanding of mathematics and to develop robust mathematical identities (McGee & Martin, 2011; Stinson, 2008). Yet, when I looked at the knowledge bases typically emphasized in educational literature and schools of education (see, e.g., Ball, Thames, & Phelps, 2008; Darling-Hammond, Bransford, LePage, Hammerness, & Duffy, 2005; Hill, Sleep, Lewis, & Ball, 2007), I did not see anything that acknowledged what I characterize as the *political nature of teaching* that the teachers I studied seemed to understand and possess.

Instead, there was and is an emphasis on many of the things that have taken center stage in schools of education for decades: content knowledge, pedagogical knowledge, and pedagogical content knowledge (Shulman, 1987). Recently, several researchers have made significant gains in extending these knowledge bases to better address the needs of Black, Latin@, American Indian, and low-income youth, especially drawing on concepts such as: funds of knowledge (Civil, 2002;

Foote, 2009; Gonzalez, Andrade, Civil, & Moll, 2001), culturally relevant/responsive teaching (Aguirre & Zavala, 2013; Leonard, Brooks, Barnes-Johnson, & Berry, 2010; Turner, Drake, McDuffie, Aguirre, Bartell, & Foote, 2012), ethnomathematics (D'Ambrosio, 1985; Knijnik, 2007; Powell & Frankenstein, 1997), and social justice mathematics teaching (Turner & Strawhun, 2005; Frankenstein, 2005; Gutstein, 2003). Nevertheless, the political component of teaching is still largely missing from discussions of important knowledge that teachers need.

In this commentary, I highlight some of the ways that both mathematics and mathematics teaching are political. I then argue that educators in general, and mathematics educators in particular, must expand what we consider to be necessary knowledge for teaching, adding political knowledge for teaching. Finally, I share what I have learned from supporting mathematics teachers to develop political knowledge and to advocate for historically underserved and/or marginalized youth.

## Mathematics and Mathematics Teaching is Political

One might laugh at the *Calvin and Hobbes*<sup>3</sup> comic strip in which Calvin suggests that mathematics is a religion. But, similar to religion, there are many ways in which mathematics requires believing a particular paradigm and a way of doing things in the world. Mathematics carries with it a set of values that are transmitted every time we engage in it (Burton, 1994). And, while it may be easy to see how mathematics education is political (e.g., as a result of teacher beliefs, tracking, stereotypes, racism), I am arguing that mathematics, itself, is political. Let us consider how.

Mathematics operates with a kind of formatting power on our lives. Viewed as objective, unrelated to emotions or morals, mathematics is often seen as an arbiter of “truth” (Christensen, Skovsmose, & Yasukawa, 2008; Volmink, 1994). In fact, many college students choose to major in the discipline because they see it as black and white, involving one right answer, and giving them a sense of satisfaction at efficiently arriving at that answer. The terms “elegant” or “beautiful” mathematics can convey this phenomenon of presenting the simplest path to the correct solution. Yet ask a mathematician whether mathematics is black and white and you will likely get an argument that highlights the uncertainty in mathematics (Borba & Skovsmose, 1997). In fact, as Calvin in the comic strip suggests, many forms of mathematics require a leap of faith. For example, the mathematics community has verified neither Kepler’s sphere-packing conjecture nor the classifica-

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<sup>3</sup> *Calvin and Hobbes* by Bill Watterson, March 9, 2011.

tion of simple finite groups—yet mathematics continues its expansion. Moreover, highly theoretical branches of mathematics rely on probability rather than certainty. Yet we continue to view mathematics as truth, not social phenomena.

When we operate with mathematics as an objective arbiter of truth, we maintain its status as pure, separate from and even superior to other fields. However, similar to whiteness, mathematics holds unearned privilege in society.<sup>4</sup> That is, we could have a society where being artistic or relating well to other people would be seen as signs of “intelligence.” Instead, in much of the West and the colonized world, mathematical proficiency is used as a proxy for intelligence. Yet there is nothing inherent in mathematics that qualifies it to deem one as intelligent. That is the myth we have constructed: some people are good at mathematics and some are not; therefore, some people possess intelligence and some do not. In general, we fail to question the unearned privilege that mathematics holds in society, in part, because we are convinced that it is merely a reflection of our natural world. Ontologically, we see mathematical concepts as separate from humans. We point to Fibonacci sequences in flowers, seeds, shells, animals, and music to confirm that mathematics reflects enduring truths, the way things were meant to be. Presented as a mere reflection of the order in our universe, mathematics becomes a means to control (B. Rotman, as cited in Walkerdine, 2004).<sup>5</sup>

One way that mathematics operates as a proxy of intelligence is through reasoning (Walkerdine, 2004). Based on a Western conception of rationality, individuals are seen to progress through levels of reasoning until they reach the highest level of intellectual thought: abstracted logic. Abstraction requires an absence of intimacy and humanity. In schools, the value placed on abstraction translates into an overreliance on algebra and calculus rather than other forms of mathematics and a privileging of the symbolic form, coming up with the correct equation or the most general rule, rather than understanding the meaning of variables or the context in which a mathematics problem occurs. When abstract thinking represents the highest form of intellect, those who deviate from that form are seen as primitive. Hence, mathematics—by way of simultaneously being highly valued in society (conveying intelligence) and involving abstraction (requiring an individual to separate from one’s body and emotions)—can be viewed as a form of microaggression (Solórzano, 1998; see also Gutiérrez, in preparation a). I am not suggesting that we completely change the mathematics content we are teaching.

<sup>4</sup> Elsewhere, Martin (2013) has argued that mathematics *education* (emphasis added) operates as White institutional space. I am arguing that mathematics itself operates as whiteness.

<sup>5</sup> When mathematics does not coincide with the physical world, mathematicians claim it operates in a world unto itself. Yet mathematics is always a form of recasting (Panza, 2013) that presents slippage between object and form (Landry, 2013).

But as long as mathematics continues to convey status in society, we need to be more cognizant of what we are asking students to do in order to participate in mathematics classrooms. In fact, many teachers (and researchers) are unknowingly complicit in the reproduction of mathematics as a form of microaggression. This residue of participating in school mathematics continues into individuals' adult lives (see, e.g., Martin, 2006).

By virtue of mathematics being political, all mathematics *teaching* is political. All mathematics teachers are identity workers, regardless of whether they consider themselves as such or not. They contribute to the identities students construct as well as constantly reproduce what mathematics is and how people might relate to it (or not). Hence, any form of teaching that breaks with tradition can be seen as subversive. Subversive mathematics teaching, among other things, creates a counter-narrative to the achievement gap discourse; questions the forms of mathematics presented in school; highlights the humanity and uncertainty of mathematics; positions students as authors of mathematics; challenges deficit narratives of students of color in need of mathematics; and recognizes that not all students aspire to (or should) become research mathematicians or scientists (Gutiérrez, 2013c, in preparation b).

### Knowledge(s) Needed for Teaching

Although I use the term “knowledge” in the title of this commentary, I prefer the term *conocimiento* (Anzaldúa & Keating, 2002). Knowledge is the literal translation of the Spanish word *conocimiento*, yet knowledge (in English) does not allow us to distinguish between things we know objectively versus subjectively.<sup>6</sup> For me, political *conocimiento* assumes clarity and a stance on teaching that maintains solidarity *with* and commitment to one's students. Among other things, political *conocimiento* involves: understanding how oppression in schooling operates not only at the individual level but also the systemic level; deconstructing the deficit discourses about historically underserved and/or marginalized students; negotiating the world of high-stakes testing and standardization; connecting with and explaining one's discipline to community members and district officials; and buffering oneself, reinventing, or subverting the system in order to be an advocate for one's students.

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<sup>6</sup> The distinction between *conocimiento* and knowledge is similar to the difference between the terms Chicana and Mexican. The choice to use Chicana to define myself instead of Mexican (or Mexicana) is not just an indication that I have indigenous ancestry; it is a political statement about the indigenous people (now referred to as Mexicans) who were on this land before the U.S.-Mexico border was created.

For-profit corporations like Pearson are moving forward with teaching materials, assessment items (e.g., Partnership for Assessment of Readiness for College and Career [PARCC]), and evaluation procedures for credentialing teachers (e.g., Teacher Performance Assessment [edTPA]), all with the argument that students across the nation need to be “college and career ready.” Such goals sound lofty until one examines them more deeply. Being ready for college does not necessarily mean one’s education has been meaningful, one’s cultural roots have been strengthened, or that one is ready to participate in a democratic society. It merely means one has learned to play the game of school and can decipher the materials necessary to gain acceptance into college. The meaning behind “career ready” is even murkier. Presumably, industry officials were not contacted to develop test items that would indicate an individual is ready to enter a career. Many organizations rely on Conley’s (2010) definition of career readiness that suggests students will be prepared to enroll and succeed, without remediation, in a post-secondary certificate program that provides entry into a career pathway. What many miss by focusing almost exclusively on mathematics and English language arts content, however, is four key skills that Conley also promotes: listening, speaking, research, and technology proficiency. These skills get at some of the analytic and interpersonal capacities that we need to participate in a democratic society. Yet, in today’s political economy, corporations continue to narrowly define what counts as learning and high-quality teaching and, therefore, what counts as being an educational professional.

Therefore, mathematics teachers need to be able to do more than just construct good lesson plans that are inquiry-based or be prepared to develop meaningful relationships with their students. They must be able to deconstruct narratives being written about education in general (e.g., in movies like *Waiting for Superman*, reports about falling U.S. rankings on international tests of achievement, studies and initiatives funded by the Bill and Melinda Gates Foundation) and about Black, Latin@, American Indian, and low-income youth in particular (e.g., media reports about the achievement gap, Race to the Top policies, the push for charter schools). Elsewhere, I have argued:

Making dominant discourses more apparent is a necessary step toward both recognizing how those discourses dis/advantage individuals and in challenging those discourses and their associated practices so as to put new ones into place ...deconstruction is a useful process, as it highlights the ways in which current realities are not necessarily the only, or the most natural, of those that could be constructed (e.g., we could have a very different evaluation system in place for students, teachers, and researchers). (Gutiérrez, 2013a, p. 14)

Until teachers are given the proper time and support to reflect on broader social realities involved in schooling, mathematics, identity, and power, they are unlike-

ly to challenge the powerful messages and policies being enacted by those outside of education. One example is the “achievement gap” discourse.

Much of the discourse around closing the achievement gap implies the root of the problem is technical—How do we design curriculum and instruction so as to better motivate and engage students who are Black, Latin@, low income, or English learners (Gutiérrez, 2008)? Yet building a site that engages and advances such learners in meaningful ways is not the most difficult part; *sustaining* it is. Studies of successful mathematics teachers and mathematics departments indicate that they experience backlash when they succeed with historically underserved and/or marginalized students. For example, several of the successful mathematics departments I studied did not receive praise or support from their principals. In fact, I often found myself in the position of touting their success or advocating for faculty. The problem is not technical; it is moral. Do we have the desire and will to support (and extend to other schools) the pockets of success that already exist throughout the nation? A brief look at history tells us that we do not.

Union High, for example, was a Chicago school with 87% of students qualifying for free or reduced-price meals, but where 45% of the senior class was taking calculus; however, its gains in students mathematical understanding and percentages of seniors taking calculus were derailed by district politics and a back-to-basics movement (Gutiérrez, 1999a; 2000; 2002; Strutchens, Quander & Gutiérrez, 2011; H. Morales, personal communication, 2011). Even though teachers were successful at making mathematics meaningful to students, getting students to take large numbers of mathematics courses (especially advanced courses), and to develop robust mathematical identities, administrators were intent on getting teachers to focus on test scores to the exclusion of all other efforts. Some political knowledge extended teachers’ efforts for a few years. For example, when they were told to stop using Interactive Mathematics Program (IMP)<sup>7</sup> textbooks in favor of district assigned texts, they offered to become a “control group” for the district so they could be compared to other schools instituting the new textbooks. When they were eventually forced to give up the IMP textbooks, they met outside of school to discuss how they could maintain the reform-oriented curriculum and the focus on group learning that had engaged their students. Using IMP-inspired principles and worksheets they had copied, they described their teaching as “IMP in the closet.” Eventually, fed up with the politics and stripped of their professional judgment, several teachers left the school.

Railside High, a Northern California school so successful it has been studied by several teams of researchers (Boaler, 2006; 2008; Boaler & Staples, 2008; Hand, 2004; 2012; Horn, 2005; Jilk, 2010, in press) and used as a model for pro-

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<sup>7</sup> For information about the Interactive Mathematics Program (IMP), see <http://mathimp.org>.

fessional development (Jilk, 2012; Jilk & O'Connell, in press), experienced an analogous phenomenon. Similar to Union High, the school served primarily Latin@ students and students who qualified for free or reduced-price meals. After several years of success using integrated mathematics curriculum, group work, and a focus on assigning competence to students, district politics (e.g., mandated direct instruction) derailed teachers' efforts and many effective teachers left the school. Not only did the school fail to sustain its efforts but also Jo Boaler, who first published the success of the mathematics department, was publicly attacked for several years by mathematics professors who vehemently opposed reform mathematics (Jaschik, 2012). Moreover, teachers at the school were harassed in efforts to disclose the school sites and discredit the findings (L. M. Jilk, personal communication, January 2012). Clearly, getting more historically underserved and/or marginalized students to engage and perform well in mathematics is not a technical problem with a technical solution.

### *Preparing Teachers to Act on Their Political Knowledge*

Given the current context of high-stakes education, I seek to help teachers build the knowledge and stances required to creatively resist a definition of the profession that unnecessarily limits the relationship between mathematics and historically underserved and/or marginalized youth. Elsewhere, I have described the process of creative insubordination whereby teachers find loopholes in policies or interpret rules and/or procedures in ways that allow them to advocate for historically underserved and/or marginalized students (Gutiérrez, 2013a, 2013b, 2013c; Gutiérrez & Gregson, 2013). My research team<sup>8</sup> and I have worked to develop an equity-based teacher education program that aims to influence the knowledge bases, skills, and dispositions of pre-service secondary mathematics teachers (PSMTs) who prepare for and eventually teach historically underserved and/or marginalized students (Gutiérrez, Irving, & Gerardo, 2013). The pre-service teachers are mathematics majors who receive a minor in education. During their 2 years as pre-service teachers, the PSMTs attend the regular teacher education program, which includes field observations, lesson planning, and portfolio development, among other things, for state-level credentials in grades 6–12 mathematics. They also participate in a 3-hour, biweekly seminar that focuses on issues of rigorous and creative mathematics, social justice teaching, as well as strategies for supporting historically underserved and/or marginalized youth and for negotiating teaching in an era of high stakes testing; conferences and movie viewings that provide deeper understandings of students in a diverse society; and meet every

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<sup>8</sup> Members of the research team include the following graduate students: Sonya E. Irving, Juan M. Gerardo, and Gabriela Vargas.

other week with our partner teacher who models creative insubordination in practice. The PSMTs also are required to develop activities for and volunteer in a weekly afterschool mathematics club that supports Black and Latin@ middle school students. Finally, each PSMT attends bi-weekly, hour-long mentoring sessions with me and/or a doctoral student. With respect to political conocimiento, pre-service teachers in our program learn to do more than just deconstruct racist comments and policies in their schools. Through cycles of rehearsals and role-plays, they learn how to speak back to such policies and comments.

The teachers with whom I have worked and who have developed political knowledge exhibit political clarity (Bartolomé, 1994). Similar to the Black teachers in Beauboeuf-Lafontant's (1999) study who knew how to advocate for their Black students in segregated schools, the PSMTs know what they stand for and aim to have their everyday teaching practices mirror that stance. They recognize that all teaching is political and that their definitions of mathematics and learning affect their pedagogy, as well as who learns and what is learned in their classrooms. They can articulate to other teachers why having political clarity is important and can convince people around them that they also should take such a stance on teaching (Gutiérrez, 2013b, 2013c).

More than just profess the importance of political conocimiento, teachers in our project are able to take action. Some of the things they have exhibited include:

- Instituting regular learning logs to help students get in touch with what they are learning and what they still need to learn, rather than just relying on test scores to indicate their achievement.
- Renaming a course to reflect the fact that it only covers Western, Euclidean geometry, not all geometries that are practiced in the world.
- Standing up to an administrator in a public meeting when he implied that Black student culture was the cause of the achievement gap at their school.
- Challenging a school dress-code policy that disproportionately penalized Black students for wearing “sagging pants.”
- Refusing to go along with procedures at a workshop that asked teachers to publicly advocate for the Common Core State Standards in mathematics.
- Convincing a co-teacher that the mathematics being taught needed to reflect a more rigorous curriculum so that students understood why particular procedures worked.
- Helping lead a professional development workshop so that local teachers could reflect on how their definitions of mathematics influenced who did well in their mathematics classes.

These acts of teaching are not easy. Nonetheless, our PSMTs suggested that some of the things which supported them to take risks in their teaching and in their interactions with colleagues include having opportunities to reflect on the nature of mathematics (i.e., What is mathematics?), deconstruct prevailing discourses in education within a community of teachers who seek to reclaim the profession and humanize the mathematics classroom, and interact with more experienced teachers who model political conocimiento.

I have argued that in addition to mathematics teaching, mathematics itself is political. As a result, I have suggested that all mathematics teachers are identity workers that need to develop political conocimiento, involving the interdependent relationships necessary to deconstruct the images of mathematics, public education, teaching, and learning that circulate in mainstream society. Given how easily school politics have derailed highly successful mathematics departments, it is important that we prepare urban mathematics teachers for the kinds of scenarios they will face and give them opportunities to practice taking a stand in high-needs schools. Expanding the knowledge base we consider necessary for teaching to include political knowledge is one step in the right direction. With greater awareness of the unearned privilege that mathematics holds in society, teachers are better prepared to rethink their role in how mathematics is carried out in school and society. If we intend to transform learning and our relationship to mathematics and each other on this planet, political knowledge needs to be taken as seriously as notions of content knowledge, pedagogical knowledge, and pedagogical content knowledge. As the nation pushes to have more students master school mathematics and enter STEM (science, technology, engineering, and mathematics) related fields, we must consider how this emphasis will influence the kinds of citizens and, in the end, the kinds of humans, we create.

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